

**CLAIMS**

What is claimed is:

1. An intensified solid-state imaging sensor, comprising:
  - 5 a photo cathode having an input side for receiving light from an image, and an output side from which electrons produced by the photo cathode exit;
  - b. a microchannel plate having an input surface positioned adjacent to the output surface of the photo cathode, an output surface from which an increased number of electrons exit, and a plurality of channels formed between the input surface and the output surface;
  - 10 c. a first electrical connection for applying a first biasing voltage between the photo cathode and the microchannel plate;
  - d. a solid-state imaging device having an electron receiving surface, positioned adjacent to the output surface of the microchannel plate, for receiving the increased number of electrons output from the microchannel plate, and an output for outputting an intensified image signal;
  - e. a second electrical connection for applying a second biasing voltage between the microchannel plate and the solid-state imaging sensor; and
  - f. a vacuum body holding the photo cathode, microchannel plate and solid-state imaging device together as a unit.
2. An intensified solid-state imaging sensor according to claim 1, wherein the first biasing voltage is no more than about 2000V.
- 25 3. An intensified solid-state imaging sensor according to claim 1, wherein the second biasing voltage is no less than approximately 100V.
4. An intensified solid-state imaging sensor according to claim 1, wherein the solid-state imaging device is a CCD.

5. An intensified solid-state imaging sensor according to claim 4, wherein the CCD is a back thinned charge-coupled device.
- 5 6. An intensified solid-state imaging sensor according to claim 4, wherein the CCD is a standard charge coupled device.
- 19 7. An intensified solid-state imaging sensor according to claim 1, wherein the solid-state imaging device is a CMOS imaging sensor.
- 15 8. An intensified solid-state imaging sensor according to claim 1, wherein the output surface of the microchannel plate and the electron receiving surface of the solid-state imaging sensor are at least in part in physical contact.
- 20 9. An intensified solid-state imaging sensor according to claim 1, wherein an insulating layer separates the output surface of the microchannel plate and the electron receiving surface of the solid-state imaging sensor.
10. An intensified solid-state imaging sensor according to claim 9, wherein the insulting layer comprises a thin film deposited on one of either the electron receiving surface of the solid-state imaging device, or the output surface of the microchannel plate.
- 25 11. An intensified solid-state imaging sensor according to claim 10, wherein the thin film is no more than approximately 10  $\mu\text{m}$  thick.
12. An intensified solid-state imaging sensor according to claim 1, wherein each of the plurality of channels has a substantially circular cross section.

13. An intensified solid-state imaging sensor according to claim 1, wherein each of the plurality of channels has a substantially square cross section.
14. An intensified solid-state imaging sensor according to claim 1, wherein each of the 5 plurality of channels in the microchannel plate has a predetermined width, and are separated by a predetermined pitch.
15. An intensified solid-state imaging sensor according to claim 14, wherein the solid-state imaging sensor comprises a plurality of collection wells of a predetermined size. 10
16. An intensified solid-state imaging sensor according to claim 15, wherein each of the plurality of channels is positioned relative to one of the plurality of collection wells so that electrons are emitted from the plurality of channels toward a predetermined 15 number of collection wells.
17. An intensified solid-state imaging sensor according to claim 16, wherein the predetermined pitch, channel width, and collection well size are such that electrons emitted from two or more channels are received by a single collection well.
- 20 *and*  
18. An intensified solid-state imaging sensor according to claim 16, wherein the predetermined pitch, channel width, and collection well size are such that electrons from one channel are received by a single collection well.
- 25 19. An intensified solid-state imaging sensor according to claim 16, wherein the predetermined pitch, channel width, and collection well size are such that electrons from one channel are received by two or more collection wells.

20. An intensified solid-state imaging sensor, comprising:
- a. a photo cathode;
  - b. a microchannel plate;
  - c. a solid-state imaging sensor that receives electrons output from the microchannel plate and outputs an intensified image signal;
  - d. an electric biasing circuit connected between the photo cathode, microchannel plate, and solid-state sensor; and
  - e. a vacuum body holding the photo cathode, microchannel plate, and solid-state imaging sensor in close physical proximity to one another.

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21. An intensified solid-state imaging sensor, comprising;

- a. a photo cathode to convert light from an image into electrons;
- b. an electron multiplying device connected to an output surface of the photo cathode, the electron multiplying device being adapted to receive electrons from the photo cathode, increase the number of electrons received, and output the increased number of electrons;
- c. a solid-state image sensor, further comprising:
  - i. a plurality of collection wells connected to the electron multiplying device to receive the increased number of electrons output from the electron multiplying device and generate an intensified image signal; and
  - ii. an output for outputting the intensified image signal to a display device;
- d. an electrical circuit connected between the photo cathode and the solid-state image sensor to apply at least one biasing voltage there between; and
- e. a body in which the photo cathode, electron-multiplying device, and solid-state image sensor are held in at least a partial vacuum.

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